The Countercultural Potential of Citizen Science

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Abstract

What is the countercultural potential of citizen science? As a participant in the wider citizen science movement, I can attest that contemporary citizen science initiatives rarely characterise themselves as countercultural. Rather, the goal of most citizen science projects is to be seen as producing orthodox scientific knowledge: the ethos is respectability rather than rebellion (NERC). I will suggest instead that there are resonances with the counterculture that emerged in the 1960s, most visibly through an emphasis on participatory experimentation and the principles of environmental sustainability and social justice.

This will be illustrated by example, through two citizen science projects that have a commitment to combining social values with scientific practice. I will then describe the explicitly countercultural organisation, Science for the People, which arose from within the scientific community itself, out of opposition to the Vietnam War. Methodological and conceptual weaknesses in the authoritative model of science are explored, suggesting that there is an opportunity for citizen science to become anti-hegemonic by challenging the hegemony of science itself. This reformulation will be expressed through Deleuze and Guattari's notion of nomadic science, the means through which citizen science could become countercultural.

Counterculture

Before examining the countercultural potential of citizen science, I set out some of the grounds for identifying a counterculture drawing on the ideas of Theodore Roszak, who

invented the term counterculture to describe the new forms of youth movements that emerged in the 1960s (Roszak). This was a perspective that allowed the carnivalesque procession of beatniks, hippies and the New Left to be seen as a single paradigm shift combining psychic and social revolution. But just as striking and more often forgotten is the way Roszak characterised the role of the counterculture as mobilising a vital critique of the scientific worldview. (Roszak p273-274)

The concept of counterculture has been taken up in diverse ways since its original formation. We can draw, for example, on Lawrence Grossberg's more contemporary analysis of counterculture (Grossberg) to clarify the main concepts and contrast them with a scientific approach. Firstly, a counterculture works on and through cultural formations. This positions it as something the scientific community would see as the other, as the opposite to the objective, repeatable and quantitative truth-seeking of science.

Secondly, a counterculture is a diverse and hybrid space without a unitary identity. Again, scientists would often see science as a singular activity applied in modulated forms depending on the context, although in practice the different sciences can experience each other as different tribes.

Thirdly, a counterculture is lived as a transformative experience where the participant is fundamentally changed at a psychic level through participation in unique events. Contrast this with the scientific idea of the separation of observer and observed, and the objective repeatability of the experiment irrespective of the experimenter.

Fourthly, a counterculture is associated with a unique moment in time, a point of shift from the old to the new. For the counterculture of the 1960s this was the Age of Aquarius. In general, the aim of science and scientists is to contribute to a form of truth that is essentially timeless, in that a physical law is assumed to hold across all time (and space), although

science also has moments of radical change with regard to scientific paradigms.

Finally, and significantly for the conclusions of this paper, according to Roszak a counterculture stands against the mainstream. It offers a challenge not at the level of detail but, to the fundamental assumptions of the status quo. This is what "science" cannot do, in as much as science itself has become the mainstream.

It was the character of science as the bedrock of all values that Roszak himself opposed and for which he named and welcomed the counterculture. Although critical of some of the more shallow aspects of its psychedelic experimentation or political militancy, he shared its criticism of the technocratic society (the technocracy) and the egocentric mode of consciousness. His hope was that the counterculture could help restore a visionary imagination along with a more human sense of community.

What is Citizen Science?

In recent years the concept of citizen science has grown massively in popularity, but is still an open and unstable term with many variants. Current moves towards institutionalisation (Citizen Science Association) are attempting to marry growth and stabilisation, with the first Annual General Meeting of the European Citizen Science Association securing a tentative agreement on the common principles of citizen science (Haklay, 10 Principles).

Key papers and presentations in the mainstream of the movement emphasise that citizen science is not a new activity (Bonney et al.) with much being made of the fact that the National Audubon Society started its annual Christmas Bird Count in 1900 (National Audubon Society). However, this elides the key role of the Internet in the current surge, which takes two distinct forms; the organisation of distributed fieldwork, and the online crowdsourcing of data analysis.

To scientists, the appeal of citizen science fieldwork follows from its distributed character; they can research patterns over large scales and across latitudes in ways that would be impossible for a researcher at a single study site (Toomey). Gathering together the volunteer, observations are made possible by an infrastructure of web tools. The role of the citizen in this is to be a careful observer; the eyes and ears of the scientist in cyberspace. In online crowdsourcing, the internet is used to present pattern recognition tasks; enrolling users in searching images for signs of new planets or the jets of material from black holes.

The growth of science crowdsourcing is exponential; one of the largest sites facilitating this kind of citizen science now has well in excess of a million registered users (Zooniverse). Such is the force of the technological aura around crowdsourced science that mainstream publications often conflate it with the whole of citizen science (Parr).

There are projects within citizen science which share core values with the counterculture as originally defined by Roszak, in particular open participation and social justice. These projects also show characteristics from Grossberg's analysis of counterculture; they are diverse and hybrid spaces, carry a sense of moving from an old era to a new one, and have cultural forms of their own. They open up the full range of the scientific method to participation, including problem definition, research design, analysis and action. Citizen science projects that aim for participation in all these areas include the Extreme Citizen Science research group at University College London (UCL), the associated social enterprise Mapping for Change (Mapping for Change), and the Public Laboratory for Open Technology and Science (Public Lab)

ExCiteS sees its version of citizen science as "a situated, bottom-up practice" that "takes into account local needs, practices and culture". Public Lab, meanwhile, argue that many citizen science projects only offer non-scientists token forms of participation in scientific inquiry that rarely amount to more that data collection and record keeping. They

counter this through an open process which tries to involve communities all the way from framing the research questions, to prototyping tools, to collating and interpreting the measurements.

ExCiteS and Public Lab also share an implicit commitment to social justice through scientific activity. The Public Lab mission is to "put scientific inquiry at the heart of civic life" and the UCL research group strive for "new devices and knowledge creation processes that can transform the world". All of their work is framed by environmental sustainability and care for the planet, whether it's enabling environmental monitoring by indigenous communities in the Congo (ExCiteS) or developing do-it-yourself spectrometry kits to detect crude oil pollution (Public Lab, Homebrew). Having provided a case for elements of countercultural DNA being present in bottom-up and problem-driven citizen science, we can contrast this with Science for the People, a scientific movement that was born out of the counterculture.

Countercultural Science from the 1970s: Science for the People

Science for the People (SftP) was a scientific movement seeded by a rebellion of young physicists against the role of US science in the Vietnam War. Young members of the American Physical Society (APS) lobbied for it to take a position against the war but were heavily criticised by other members, whose written complaints in the communications of the APS focused on the importance of scientific neutrality and the need to maintain the association's purely scientific nature rather than allowing science to become contaminated by politics (Sarah Bridger, in *Plenary 2,* 0:46 to 1:04).

The counter-narrative from the dissidents argued that science is not neutral, invoking the example of Nazi science as a justification for taking a stand. After losing the internal vote the young radicals left to form Scientists and Engineers for Social and Political Action

(SESPA), which later became Science for the People (SftP). As well as opposition to the Vietnam War, SftP embodied from the start other key themes of the counterculture, such as civil rights and feminism. For example, the first edition of *Science for the People* magazine (appearing as Vol. 2, No. 2 of the SESPA Newsletter) included an article about leading Black Panther, Bobby Seale, alongside a piece entitled 'Women Demand Equality in Science'. The final articles in the same issue are indicators of SftP's dual approach to science and change; both the radicalisation of professionals ("Computer Professionals for Peace") and the demystification of technical practices ("Statistics for the People") (Science for the People). *Science for the People* was by no means just a magazine – for example, their technical assistance programme provided practical support to street health clinics run by the Black Panthers (and brought SftP under FBI surveillance) (Herb Fox, in *Plenary 1,* 0:25 to 0:35).

Both as a magazine and as a movement, SftP showed a tenacious longevity, with the publication being produced every two months between August 1970 and May/June 1989. It mutated through a network of affiliated local groups and international links, and was deeply involved in constructing early critiques of nuclear power and genetic determinism.

SftP itself seems to have had a consistent commitment to non-hierarchical processes and,as one of the founders expressed it,. a "shit kicking" approach to putting its principles in to practice (Al Weinrub, in *Plenary 1,* 0:25 to 0:35). SftP criticised power, front and centre. It is this opposition to hegemony that puts the "counter'\" into counterculture, and is missing from citizen science as currently practised.

Cracks in the authority of orthodox science, which can be traced to both methodologies and basic concepts, follow. These can be seen as an opportunity for citizen science to directly challenge orthodox science and thus establish an anti-hegemonic stance of its own.

Weaknesses of Scientific Hegemony

My argument in this section is to show that the weaknesses of scientific hegemony are in proportion to its claims to authority (Feyerabend). Through my own scientific training as an experimental particle physicist, I have participated in many discussions about the ontological and epistemological grounds for scientific authority. While most scientists choose to present their practice publicly as an infallible machine for the production of truths, the opinions behind the curtain are far more mixed. Physicist Lee Somolin has written a devastating critique of science-in-practice that focuses on the capture of the institutional economy of science by an ideological grouping of string theorists (Smolin), and his account is replete with questions about science itself and ethnographic details that bring to life the messy behind-the-scenes conflicts in scientific-knowledge making.

Knowledge of this messiness has prompted some citizen science advocates to take science to task, for example for demanding higher standards in data consistency from citizen science than is often the case in orthodox science (Haklay, Assertions; Freitag, Good Science). Scientists will also and invariably refer to reproducibility as the basis for the authority of scientific truths. The principle that the same experiments always get the same results, irrespective of who is doing the experiment, and as long as they follow the same method, is a foundation of scientific objectivity.

However, 2012 study of landmark results in cancer science was able to reproduce only 11 per cent of the original findings (Begley and Ellis). While this may be an outlier case, there are broader issues with statistics and falsification, a bias on positive results, weaknesses in peer review and the "publish or perish" academic culture (The Economist).

While the pressures are all-too-human, the resulting distortions are rarely acknowledged in public by scientists themselves. On the other hand, citizen science has been

slow to pick up the gauntlet. For example, while some scientists involved in citizen science have commented on the inequality and inappropriateness of orthodox peer review for citizen science papers (Freitag, “What Is the Role”) there has been no direct challenge to any significant part of the scientific edifice.

I would argue that the nearest thing to a real challenge to orthodox science is the proposal for a post-normal science, which pre-dates the current wave of citizen science. Post-normal science tries to accommodate the philosophical implications of post-structuralism and at the same time position science to tackle problems such as climate change,, intractable to reproducibility (Funtowicz and Ravetz).

It accomplishes this by extending the domains in which science can provide meaningful answers to include issues such as global warming, which involve high decision stakes and high uncertainty. It extends traditional peer review into an extended peer community, which includes all the stakeholders in an issue, and may involve active research as well as quality assessment.

The idea of extended peer review has obvious overlaps with community-oriented citizen science, but has yet to be widely mobilised as a theoretical buttress for citizen-led science. Prior even to post-normal science are the potential cracks in the core philosophy of science. In her book *Cosmopolitics*, Isabelle Stengers characterises the essential nature of scientific truth as the ability to disqualify and exclude other truth claims. This, she asserts, is the hegemony of physics and its singular claim to decide what is real and what is true.

Stengers traces this, in part, to the confrontation more than a hundred years ago between Max Planck and Ernst Mach, whereas the latter argued that claims to an absolute truth should be replaced by formulations that tied physical laws to the human practices that produced them. Planck stood firmly for knowledge forms that were unbounded by time,

space or specific social-material procedures (Stengers). Although contemporary understandings of science are based on Planck's version, citizen science has the potential to re-open these questions in a productive manner for its own practices, if it can re-conceive of itself as what Deleuze and Guattari would call nomadic science (Deleuze)(Deleuze & Guattari).

Citizen Science as Nomadic Science

Deleuze and Guattari referred to orthodox science as Royal Science or Striated Science, referring in part to its state-like form of authority and practice, as well as its psycho-social character. Their alternative is a smooth or nomadic. science which, importantly for citizen science, does not have the ambition to totalise knowledge.

Nomadic science is a form of empirical investigation that has no need to be hooked up to a grand narrative. The concept of nomadic science is a natural fit for bottom-up citizen science because it can valorise truths that are non-dual and that go beyond objectivity to include the experiential. In this sense it is like the extended peer review of post-normal science but without the need to be limited to high-risk high-stakes questions. As there is no *a priori* problem with provisional knowledges, it naturally inclines towards the local, the situated and the culturally reflective. The apparent unreliability of citizen science in terms of participants and tools, which is solely a source of anxiety, can become heuristic for nomadic science when re-cast through the forgotten alternatives like Mach's formulation; that truths are never separated from the specifics of the context and process that produced them (Stengers pp6-18 & p223).

I believe a nomadic science will start to emerge through projects that are prepared to tackle toxic epistemology as much as toxic pollutants. For example, the Community Based Auditing (CBA) developed by environmental activists in Tasmania (Tattersall) challenges

local alliances of state and extractive industries by undermining their own truth claims with regards to environmental impact, a process described in the CBA Toolbox as disconfirmation. In CBA, this mixture of post-normal science and Stenger's critique is combined with forms of data collection and analysis known as Community Based Sampling (Tattersall et al), which would be recognisable to any citizen science project.

The change from citizen science to nomadic science is not a total rupture but a shift in the starting point: it is based on an overt critique of power. One way to bring this about is being tested in the 'Kosovo Science for Change' (Science for Change Kosovo), project, where I am a researcher and where we have adopted the critical pedagogy of Paulo Freire as the starting point for our empirical investigations (Freire). Critical pedagogy is learning as the co-operative activity of understanding how our lived experience is constructed by power, and how to make a difference in the world. Taking a position as nomadic science, openly critical of Royal Science, is the anti-hegemonic stance that would qualify citizen science as properly countercultural.

Citizen Science and Counterculture

Counterculture as I have expressed itis a standing against or rejection of the hegemonic culture. However, there is a strong tendency in contemporary social movements to take a stance not only against the dominant structures but against hegemony itself. They contest what Richard Day calls the hegemony of hegemony (Day).

I witnessed this during the counter-G8 mobilisation of 2001. Having been an activist in the 1980s and 1990s I was wearily familiar with the sectarian competitiveness of various radical narratives, each seeking to establish itself as the correct path. So it was a strongly affective experience to stand in the convergence centre and listen to so many divergent social groups and movements agree to support each other's tactics, expressing a solidarity based on

a non-judgemental pluralism. Since then we have seen the emergence of similarly anti-hegemonic countercultures around the Occupy and Anonymous movements. It is in this context of counterculture that I will try to summarise and evaluate the countercultural potential of citizen science and what being countercultural might offer to citizen science itself.

To be countercultural it is not enough for citizen science to counterpose participation against the institutional and hierarchical aspects of professional science. As an activity defined purely by engagement it offers to plug the legitimacy gap for science while still being wholly dependent on it. A countercultural citizen science must pose a strong challenge to the status quo, and I have suggested that a route to this would be to develop as nomadic science.

I note that this does not mean replacing or overthrowing science but constructing an other to science with its own claim to empirical methods. It is fair to ask what this would offer citizen science that it does not already have. At an abstract level it would gain a freedom of movement; an ability to occupy Deleuzian smooth spaces rather than be constrained by the striation of established science.

The founders of Science for the People are clear that it could never have existed if it had not been able to draw on the mass movements of its time. Being countercultural would give citizen science an affinity with the bottom-up, local and community-based issues where empirical methods are likely to have the most social impact. One of many examples is the movement against fracking (the hydraulic fracturing of deep rock formations to release shale gas). Together, these benefits of being countercultural open up the possibility for forms of citizen science to spread rhizomatically in a way that is not about immaterial virtual labour but is itself part of a wider cultural change. The possibility of a nomadic science stands as a doorway to the change that Roszak saw at the heart of the counterculture, a renewal of the visionary imagination.

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